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10/596,359	06/09/2006	Hajime Kando	36856.1450	5636
54066 7590 08/12/2009 MURATA MANUFACTURING COMPANY, LTD. C/O KEATING & BENNETT, LLP 1800 Alexander Bell Drive SUITE 200 Reston, VA 20191				
EXAMINER ROSENAU, DEREK JOHN				
ART UNIT 2837		PAPER NUMBER		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/596,359

Applicant(s)

KANDO, HAJIME

Examiner

Derek J. Rosenau

Art Unit

2837

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 23-28, 30, 31 and 33-57 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 23-28, 30, 31 and 33-57 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB008)
Paper No(s)/Mail Date 4/20/09 5/21/09
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(c), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(c) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 24 June 2009 has been entered.

Specification

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 23-28, 30, 31, and 33-57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what is meant by "an outer surface". As currently written, this language can be read as referring to any of the surfaces of the single crystal substrate, including the top, sides, and bottom. In the case of the top surface and side surfaces,

the functional language recited is not accurate. Based on the specification and the drawings, it appears that this language is intended to refer to the bottom surface or the surface opposite the surface that abuts against the solid layer.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 23-28, 31, 33, 35-38, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. (US 2002/0158549) in view of Taniguchi (US 2001/0008387), Takayama et al. (US 2004/0174233), and Nishiyama et al. (US 2007/0132339).

7. With respect to claim 31, Itakura et al. discloses a boundary acoustic wave device (Fig 1) using a non-leaky propagation type boundary acoustic wave, comprising: a boundary acoustic wave element, including a single crystal substrate (item 4), a solid layer (item 6) provided on the single crystal substrate, and interdigital electrodes (item 5) arranged at a boundary between the single crystal substrate and the solid layer (Fig 1); wherein the single crystal substrate has a cut angle (Paragraph 86).

Itakura et al. does not disclose expressly a plurality of boundary acoustic wave elements, the single crystal substrates of those elements having the same cut angle, or a propagation direction of a boundary acoustic wave of at least one of the boundary acoustic wave elements is different from that of at least one of the other boundary acoustic wave resonators, or that the thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic

wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate, or that $H/\lambda > 8261.744\rho^{-1.376}$, when ρ represents the density of the electrodes, H represents the thickness of the electrodes, and λ represents the wavelength of a boundary wave which is defined by a placement period of electrode fingers of the interdigital electrodes, or that $\rho > 3745 \text{ kg/m}^3$.

Taniguchi teaches a boundary acoustic wave device having a plurality of boundary acoustic wave elements (Fig 5), the single crystal substrates of those elements having the same cut angle (Paragraph 49), and a propagation direction of a boundary acoustic wave of at least one of the boundary acoustic wave elements is different from that of at least one of the other boundary acoustic wave resonators (Fig 5).

Takayama et al. teaches a boundary acoustic wave device in which the thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate (Paragraphs 8 and 83). Takeyama et al. also discloses that $H/\lambda > 8261.744\rho^{-1.376}$, when ρ represents the density of the electrodes, H represents the thickness of the electrodes, and λ represents the wavelength (Paragraph 8) which is defined by a placement period of electrode fingers of the interdigital electrodes (Paragraph 3, Equation 1 – wavelength is equal to v/f). Takeyama et al. discloses that the material from which the electrodes are made should have a density greater than that of aluminum. Nishiyama et al. teaches a boundary acoustic wave device in which the electrode may be made of a large number of materials, among them materials

having densities greater than 3745 Kg/m^3 (Paragraph 32). Although Takayama et al. does not disclose explicitly the functional language "so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate," this would be inherent as Takayama et al. discloses the electrode thicknesses and placement periods disclosed in the specification

With respect to the language "energy of the boundary acoustic wave is not present on an outer surface of the single crystal substrate and is not present on an outer surface of the solid layer", this is merely functional language that does not, by itself, provide any additional structure to the device. Therefore, as the combination of Itakura et al., Taniguchi, and Takayama et al. discloses each of the claimed structural features, the structure resulting from this combination would be capable of performing the same functions.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the plurality of boundary acoustic wave elements having different propagation directions of Taniguchi, the electrode thickness of Takayama et al., and the electrode materials of Nishiyama et al. with the boundary acoustic wave device of Itakura et al. for the benefit of allowing for different electromechanical coupling coefficients within the same device (Paragraph 58 of Taniguchi) and of reducing the propagation loss (Paragraph 8 of Takayama et al.), and as the electrode materials taught by Nishiyama are well known for their use as electrode materials.

8. With respect to claim 23, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

Taniguchi discloses that the plurality of boundary acoustic wave elements are boundary acoustic wave filters or boundary acoustic wave resonators (Paragraph 58).

9. With respect to claim 24, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

Taniguchi discloses that the plurality of boundary acoustic wave elements define resonators (Paragraph 58).

10. With respect to claim 25, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

Taniguchi discloses that the boundary acoustic wave device is a longitudinally coupled filter (Fig 5).

11. With respect to claim 26, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

Taniguchi discloses that the boundary acoustic wave elements are provided on a single piezoelectric single crystal substrate (Paragraph 58).

12. With respect to claim 27, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

Taniguchi discloses that an electromechanical coefficient of at least one of the boundary acoustic wave elements is different from that of at least one of the other boundary acoustic wave elements (Paragraph 58).

13. With respect to claim 28, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

Taniguchi discloses that a band width of at least one of the boundary acoustic wave elements is different from that of at least one of the other boundary acoustic wave elements (Paragraph 55).

14. With respect to claim 33, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

Takayama discloses that $33000.39050\rho^{-1.50232} < H/\lambda < 88818\rho^{-1.54998}$ (Paragraphs 8 and 30).

Nishiyama et al. discloses several electrode materials for the interdigitated electrode (Paragraph 32) with densities greater than 3745 kg/m^3 , including nickel, which would satisfy the above range of values for H/λ . The density of nickel is 8908. Substituting for ρ , $33000.39050 * 8908^{-1.50232} = .0384$. Takayama discloses that H/λ should be between 0.03 and 0.15; therefore, the H/λ meets the claimed range of values for H/λ .

15. With respect to claim 35, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

Taniguchi discloses that the interdigital electrodes each include a main electrode layer made from a material selected from the group consisting of Au, Ag, Cu, Al, Fe, Ni, W, Ta, Pt, Mo, Cr, Ti, ZnO, and ITO (Paragraph 61).

16. With respect to claim 36, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 35.

Nishiyama et al. discloses that the interdigital electrodes each include an additional electrode layer (Fig 1F and 1G, item 5) laminated on the main electrode layer (item 4A).

17. With respect to claim 37, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 36. Itakura discloses that the solid layer includes a dielectric substance (Paragraph 97).

18. With respect to claim 38, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 37. Itakura et al. discloses that the dielectric substance includes a material primarily composed of SiO_2 (Paragraph 97).

19. With respect to claim 41, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 37. Itakura et al. discloses that the solid layer includes at least one material selected from the group consisting of Si, SiO_2 , glass, silicon nitride, silicon carbide, ZnO, Ta_2O_5 , titanate zirconate lead piezoelectric ceramic, aluminum nitride, Al_2O_3 , LiTaO_3 , and LiNbO_3 (Paragraph 97).

20. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nishiyama et al., and Takamine (US 20020135267).

21. With respect to claim 30, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

None of Itakura et al., Taniguchi, Takayama et al., or Nishiyama et al. discloses expressly that a duty ratio of the interdigital electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse layer propagating through the piezoelectric single crystal substrate.

Takamine teaches a boundary acoustic wave device in which a duty ratio of the interdigital electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse layer propagating through the piezoelectric single

crystal substrate (Paragraph 64 and Table 1). Although Takamine does not disclose explicitly the functional language "so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse layer propagating through the piezoelectric single crystal substrate," this would be inherent as Takamine discloses the IDT duty ratios disclosed in the specification.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the IDT duty ratio of Takamine with the boundary acoustic wave device of Itakura et al. as modified by Taniguchi and Takayama et al. as it has been held that optimization of a device, where the general conditions are met by the prior art, would be obvious to a person of ordinary skill in the art (*In re Aller*, 105 USPQ 233).

22. Claims 34, 43-48, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., and Nakahata (US 6025636).

23. With respect to claim 34, Itakura et al. discloses a boundary acoustic wave device (Fig 1) using a non-leaky propagation type boundary acoustic wave, comprising: a boundary acoustic wave element, including a single crystal substrate (item 4), a solid layer (item 6) provided on the single crystal substrate, and interdigital electrodes (item 5) arranged at a boundary between the single crystal substrate and the solid layer (Fig 1); wherein the single crystal substrate has a cut angle (Paragraph 86); and, as best the examiner can ascertain, wherein properties of the boundary acoustic wave device are not changed by changes in surface conditions of the single crystal substrate and the solid layer.

Itakura et al. does not disclose expressly a plurality of boundary acoustic wave elements, the single crystal substrates of those elements having the same cut angle, or a propagation direction of a boundary acoustic wave of at least one of the boundary acoustic wave elements is different from that of at least one of the other boundary acoustic wave resonators, or that the thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate, or that the piezoelectric single crystal substrate is LiNbO₃ substrate, ϕ of Euler angles (ϕ, θ, ψ) of the LiNbO₃ substrate is in the range -31° to 31° , and θ and ψ are in the range surrounded by the points A1 to A13 shown in table 1.

Points	$\Psi(^{\circ})$	$\Theta(^{\circ})$
A01	0	116
A02	11	118
A03	20	123
A04	25	127
A05	33	140
A06	60	140
A07	65	132
A08	54	112
A09	48	90
A10	43	87
A11	24	90

A12	0	91
A13	0	118

Taniguchi teaches a boundary acoustic wave device having a plurality of boundary acoustic wave elements (Fig 5), the single crystal substrates of those elements having the same cut angle (Paragraph 49), and a propagation direction of a boundary acoustic wave of at least one of the boundary acoustic wave elements is different from that of at least one of the other boundary acoustic wave resonators (Fig 5).

Takayama et al. teaches a boundary acoustic wave device in which the thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate (Paragraphs 8 and 83). Although Takayama et al. does not disclose explicitly the functional language "so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate," this would be inherent as Takayama et al. discloses the electrode thicknesses disclosed in the specification.

Nakahata teaches a boundary acoustic wave device in which the piezoelectric single crystal substrate is LiNbO₃ substrate, ϕ of Euler angles (ϕ, θ, ψ) of the LiNbO₃ substrate is in the range -31° to 31° , and θ and ψ are in the range surrounded by the points A1 to A13 (column 9, line 65 through column 10, line 18).

With respect to the language “energy of the boundary acoustic wave is not present on an outer surface of the single crystal substrate and is not present on an outer surface of the solid layer”, this is merely functional language that does not, by itself, provide any additional structure to the device. Therefore, as the combination of Itakura et al., Taniguchi, and Takayama et al. discloses each of the claimed structural features, the structure resulting from this combination would be capable of performing the same functions.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the plurality of boundary acoustic wave elements having different propagation directions of Taniguchi, the electrode thickness of Takayama et al., and the crystal orientation of Nakahata with the boundary acoustic wave device of Itakura et al. for the benefits of allowing for different electromechanical coupling coefficients within the same device (Paragraph 58 of Taniguchi), reducing the propagation loss (Paragraph 8 of Takayama et al.), and improving the coupling coefficient (column 2, lines 29-42 of Nakahata).

24. With respect to claims 43-48 and 50, the subject matter thereof corresponds to that of claims 23-28 and 35; therefore, claims 43-48 and 50 are unpatentable over Itakura in view of Taniguchi, Takayama et al., and Nakahata.

25. Claims 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nishiyama, and Mishima et al. (US 20050099091).

26. With respect to claim 39, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 37.

None of Itakura et al., Taniguchi, Takayama et al., or Nishiyama et al. discloses that the solid layer includes a plurality of laminates, each of the plurality of laminates including a plurality of material layers.

Mishima et al. teaches a boundary acoustic wave device in which the solid layer includes a plurality of laminates, each of the plurality of laminates including a plurality of material layers (Fig 10, items 15 and 16).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the laminates solid layer of Mishima et al. with the boundary acoustic wave device of Itakura et al. as modified by Taniguchi, Takayama et al., and Nishiyama et al. for the benefit of preventing thermal damage during the manufacturing process (Paragraph 72 of Mishima et al.).

27. With respect to claim 40, the combination of Itakura et al., Taniguchi, Takayama et al., Nishiyama et al., and Mishima et al. discloses the boundary acoustic wave device according to claim 39. Mishima et al. discloses that the solid layer includes a layer primarily composed of SiO₂ (item 15) laminated to a layer primarily composed of Si (item 16).

28. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nishiyama et al., and Kadota et al. (US 5260913).

29. With respect to claim 42, the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the boundary acoustic wave device according to claim 31.

None of Itakura et al., Taniguchi, Takayama et al., or Nishiyama et al. discloses expressly that the boundary acoustic wave elements each further includes a resin layer adhered to the solid layer.

Kadota et al. teaches a boundary acoustic wave device in which the boundary acoustic wave elements includes a resin layer (Fig 9, item 29) adhered to a solid layer (item 5).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the resin layer of Kadota et al. with the boundary acoustic wave device of Itakura et al. as modified by Taniguchi and Takayama et al. for the benefit of simplifying the manufacturing process of the device (column 6, lines 59-68 of Kadota et al.) and better protecting the device by placing the device in a packaging material.

30. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nakahata, and Takamine.

31. With respect to claim 49, the subject matter thereof corresponds to that of claim 30; therefore, claim 49 is unpatentable over Itakura in view of Taniguchi, Takayama et al., Nakahata, and Takamine.

32. Claims 51-53 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nakahata, and Nishiyama et al.

33. With respect to claims 51-53 and 56, the subject matter thereof corresponds to that of claims 36-38 and 41; therefore, claims 51-53 and 56 are unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nakahata, and Nishiyama et al.

34. Claims 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nakahata, Nishiyama, and Mishima et al.

35. With respect to claims 54 and 55, the subject matter thereof corresponds to that of claims 39 and 40; therefore, claims 54 and 55 are unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nakahata, Nishiyama, and Mishima et al.

36. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, Takayama et al., Nakahata, and Kadota et al.

37. With respect to claim 57, the subject matter thereof corresponds to that of claim 42; therefore, claim 57 is unpatentable over Itakura et al., Taniguchi, Takayama et al., Nakahata, and Kadota.

Response to Arguments

38. Applicant's arguments filed 24 June 2009 have been fully considered but they are not persuasive.

39. Applicant argues that none of Itakura et al., Taniguchi, Takayama et al., and Nakahata et al. discloses a boundary acoustic wave device. However both, Itakura et al. and Nakahata et al. are directed to both surface acoustic wave devices and boundary acoustic wave devices. A boundary acoustic wave device is merely a device that propagates an acoustic wave along an interface between two surfaces. Both Itakura et al. and Nakahata et al. disclose such devices and may therefore be considered boundary acoustic wave devices. Itakura et al. propagates an acoustic wave along the surface of the single crystal layer, which surface is defined by the boundary between the single crystal layer and the solid layer; therefore, the acoustic wave generated by the IDTs of Itakura et al. travels along the boundary between the single crystal layer and the solid layer and may therefore be considered a boundary acoustic wave device.

40. Applicant argues that neither Itakura et al. nor Nakahata et al. disclose that the energy of the acoustic wave of each of Itakura et al. and Nakahata et al. as applicant argues that the energy would necessarily be present on at least one of an outer surface of a single crystal substrate and an outer surface of a solid layer. However, this description of the energy distribution is not

entirely accurate for a boundary acoustic wave device, as the energy of the acoustic waves would be present on the surfaces along which the single crystal substrates meet and also at portions of the side surfaces of the single crystal substrate. In addition, this language is functional language that does not, by itself, provide additional structure to the claimed device. As the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses each of the claimed structural elements, the device resulting from that combination would be capable of performing the same functions.

41. Applicant argues that Takayama et al. does not disclose a thickness of the electrodes being set such that the acoustic velocity of an SH type boundary acoustic wave propagating through the solid layer is lower than the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate. However, the sole structural term in this language is the thickness of the electrodes. The remainder of this claim terminology is functional language that does not, by itself, provide additional structure. The cited section of Takayama et al. is directed to its teaching of the electrode thickness. Therefore, as Takayama et al. discloses the electrode thickness provided by the claims and specification, and as the combination of Itakura et al., Taniguchi, Takayama et al., and Nishiyama et al. discloses the remaining structural claim elements, the structure resulting from that combination would be capable of performing the same functions.

42. Applicant argues that the teachings of Takayama et al. may not be applied to a boundary acoustic wave device, arguing that its teachings are restricted to surface acoustic wave devices. However, one of ordinary skill in the art would readily recognize, given the structural and functional similarities in surface acoustic wave devices and boundary acoustic wave devices, that

the teachings derived from a surface acoustic wave device would be applicable to a boundary acoustic wave device and vice versa.

43. Applicant argues that the teachings of Nakahata are not applicable to boundary acoustic wave devices, as applicant argues that the teachings of Nakahata are restricted to surface acoustic wave devices. However, Nakahata discloses both surface acoustic wave devices and boundary acoustic wave devices; therefore its teachings are applicable to both surface acoustic wave devices and boundary acoustic wave devices. In addition, as described above, given the similarities in the structure and function of surface acoustic wave devices and boundary acoustic wave devices, one of ordinary skill in the art would readily recognize that the teachings of a surface acoustic wave device would be applicable to a boundary acoustic wave device and vice versa.

44. Applicant argues that Nakahata does not disclose a lithium niobate substrate having the claimed Euler angles recited in claim 34. However, as can be seen from column 9, line 65 through column 10, line 18 of Nakahata, the range of Euler angles recited by Nakahata overlaps the claimed range of Euler angles recited in claim 34.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Derek J. Rosenau whose telephone number is (571) 272-8932. The examiner can normally be reached on Monday thru Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Benson can be reached on (571) 272-2227. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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